

WHAT IS CLAIMED IS:

1. A process cartridge detachably mountable to a main body of an electrophotographic image forming apparatus for forming an image on a recording medium, the
5 main body having a twisted hole of which a cross-section has a plurality of corners, said process cartridge comprising:
an electrophotographic photosensitive drum;
a developing roller for developing an electrostatic
10 latent image formed on said electrophotographic photosensitive drum; and
a driving-force transmitting part provided on one lengthwise end of said electrophotographic photosensitive drum, and having a twisted protrusion to be fitted in
15 said hole, a cross-section of the twisted protrusion having a plurality of corners, a shaft portion supported by a bearing portion, and a gear portion for transmitting a driving force to said developing roller, said shaft portion and said gear portion overlapping each other in
20 an axial direction of said electrophotographic photosensitive drum,
wherein when said hole is rotated with said protrusion fitted in said hole when said process cartridge is mounted to said main body of the apparatus,
25 a rotational force of said hole is transmitted to said electrophotographic photosensitive drum through said protrusion.

2. A process cartridge according to Claim 1,
wherein said driving-force transmitting part further has
a coupling portion fitted and fixed to one end of the
drum cylinder of said photosensitive drum, and said
5 coupling portion, said gear portion, a shaft portion
having an overlap with said gear portion, and said
protrusion provided on an end surface of said shaft
portion are disposed in said axial direction in the named
order, and said coupling portion, said gear portion, said
10 shaft portion having the overlap with said gear portion,
and said protrusion are formed into one united body.

3. A process cartridge according to Claim 1 or 2,
wherein said driving-force transmitting part further has
15 a second gear portion in said axial direction between
said coupling portion and a fixed portion, and said
second gear portion transmits the driving force to a
transfer roller provided in said main body of the
apparatus.

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4. A process cartridge according to Claim 1, 2
or 3, wherein a through-hole is formed through said
coupling portion, said gear portion, said shaft portion
having the overlap with said gear portion, and said
25 protrusion, an earth pin is provided in said through-hole,
said earth pin is provided on the inner end surface of

said driving-force transmitting part, and is in contact with an earth plate which is in contact with the inner surface of said drum cylinder, whereby when said process cartridge is mounted to said main body of the apparatus,
5 said earth pin comes into contact with a main body earth contact provided in said hole, and said electrophotographic photosensitive drum is electrically earthed to said main body of the apparatus.

10 5. A process cartridge according to Claim 1, 2,
3 or 4, wherein a portion of said shaft portion is surrounded by said gear portion.

15 6. A process cartridge according to Claim 1, 2,
3, 4 or 5, wherein the cross-section of said hole is a substantially equilateral triangle, and the cross-section of said protrusion is a substantially equilateral triangle.

20 7. An electrophotographic photosensitive drum used in an electrophotographic image forming apparatus for forming an image on a recording medium, the electrophotographic image forming apparatus having a twisted hole of which a cross-section has a plurality of
25 corners, said electrophotographic photosensitive drum comprising:

 a drum cylinder having a photosensitive layer on a

peripheral surface thereof; and

a driving-force transmitting part mounted on one end of said drum cylinder, and having a twisted protrusion to be fitted in said hole, a cross-section of
5 said twisted protrusion having a plurality of corners, a shaft portion supported by a bearing portion, and a gear portion for transmitting a driving force to a developing roller, said shaft portion and said gear portion overlapping each other in an axial direction of said
10 electrophotographic photosensitive drum,
wherein when said hole is rotated with said protrusion fitted in said hole when said photosensitive drum is mounted to a main body of said apparatus, a driving force for rotating said electrophotographic
15 photosensitive drum is received from the main body of said apparatus.

8. An electrophotographic photosensitive drum according to Claim 7, wherein said driving-force
20 transmitting part further has a coupling portion fitted and fixed to one end of the drum cylinder of said photosensitive drum, and said coupling portion, said gear portion, a shaft portion having an overlap with said gear portion, and said protrusion provided on an end surface
25 of said shaft portion are disposed in said axial direction in the named order, and said coupling portion, said gear portion, said shaft portion having the overlap

with said gear portion, and said protrusion are formed into one united body.

9. An electrophotographic photosensitive drum
5 according to Claim 7 or 8, wherein said driving-force transmitting part further has a second gear portion in said axial direction between said coupling portion and a fixed portion, and said second gear portion transmits the driving force to a transfer roller provided in said main
10 body of the apparatus.

10. An electrophotographic photosensitive drum according to Claim 7, 8 or 9, wherein a through-hole is formed through said coupling portion, said gear portion,
15 said shaft portion having the overlap with said gear portion, and said protrusion, an earth pin is provided in said through-hole, said earth pin is provided on the inner end surface of said driving-force transmitting part, and is in contact with an earth plate which is in contact
20 with the inner surface of said drum cylinder, whereby when said electrophotographic photosensitive drum is mounted to said main body of the apparatus, said earth pin comes into contact with a main body earth contact provided in said hole, and said electrophotographic
25 photosensitive drum is electrically earthed to said body of the apparatus.

11. An electrophotographic photosensitive drum according to Claim 7, 8, 9 or 10, wherein a portion of said shaft portion is surrounded by said gear portion.

5 12. An electrophotographic photosensitive drum according to Claim 7, 8, 9, 10 or 11, wherein the cross-section of said hole is a substantially equilateral triangle, and the cross-section of said protrusion is a substantially equilateral triangle.

10 13. A driving-force transmitting part mounted on one end of an electrophotographic photosensitive drum used in a process cartridge detachably mountable to a main body of an electrophotographic image forming

15 apparatus for forming an image on a recording medium, the electrophotographic image forming apparatus having a twisted hole of which a cross-section has a plurality of corners, said driving-force transmitting part comprising:

 a twisted protrusion to be fitted into said hole

20 when said process cartridge is mounted to said main body of the apparatus, a cross-section of said twisted protrusion having a plurality of corners;

 a shaft portion supported by a bearing portion when said driving-force transmitting part is mounted in said process cartridge; and

 a gear portion for transmitting a driving force to a developing roller, said shaft portion and said gear

portion overlapping each other in an axial direction of said electrophotographic photosensitive drum,

wherein when said hole is rotated with said protrusion fitted in said hole when said process cartridge is mounted to said main body of the apparatus, the rotational force of said hole receives a driving force for rotating said electrophotographic photosensitive drum from said main body of the apparatus through said protrusion.

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14. A driving-force transmitting part according to Claim 13, further comprising a coupling portion fitted and fixed to one end of the drum cylinder of said photosensitive drum, wherein said coupling portion, said gear portion, a shaft portion having an overlap with said gear portion, and said protrusion provided on an end surface of said shaft portion are disposed in said axial direction in the named order, and said coupling portion, said gear portion, said shaft portion having the overlap with said gear portion, and said protrusion are formed into one united body.

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15. A driving-force transmitting part according to Claim 13 or 14, further comprising a second gear portion in said axial direction between said coupling portion and a fixed portion, wherein said second gear portion transmits the driving force to a transfer roller

provided in said main body of the apparatus.

16. A driving-force transmitting part according to Claim 13, 14 or 15, wherein a through-hole is formed
5 through said coupling portion, said gear portion, said shaft portion having the overlap with said gear portion, and said protrusion, an earth pin is provided in said through-hole, said earth pin is provided on the inner end surface of said driving-force transmitting part, and is
10 in contact with an earth plate which is in contact with the inner surface of said drum cylinder, whereby when said process cartridge is mounted to said main body of the apparatus, said earth pin comes into contact with a main body earth contact provided in said hole, and said
15 electrophotographic photosensitive drum is electrically earthed to said main body of the apparatus.

17. A driving-force transmitting part according to Claim 13, 14, 15 or 16, wherein a portion of said
20 shaft portion is surrounded by said gear portion.

18. A driving-force transmitting part according to Claim 13, 14, 15, 16 or 17, wherein the cross-section of said hole is a substantially equilateral triangle, and
25 the cross-section of said protrusion is a substantially equilateral triangle.

19. An electrophotographic image forming apparatus to which a process cartridge is detachably mountable for forming an image on a recording medium, comprising:

5 (a) a twisted hole of which a cross-section has a plurality of corners; and

 (b) a mounting portion for detachably mounting the process cartridge, the process cartridge having:

 an electrophotographic photosensitive drum;

10 a developing roller for developing an electrostatic latent image formed on said electrophotographic photosensitive drum;

 a driving-force transmitting part provided on lengthwise one end of said electrophotographic

15 photosensitive drum, and having a twisted protrusion to be fitted in said hole, a cross-section of the twisted protrusion having a plurality of corners, a shaft portion supported by a bearing portion, and a gear portion for transmitting a driving force to said developing roller,

20 said shaft portion and said gear portion overlapping each other in an axial direction of said electrophotographic photosensitive drum,

 wherein when said hole is rotated with said protrusion fitted in said hole when said process

25 cartridge is mounted to the main body of said apparatus, the rotation of said hole is transmitted to said electrophotographic photosensitive drum through said

protrusion.

20. An electrophotographic photosensitive drum
for use in a process cartridge detachably mountable to a
5 main body of an electrophotographic image forming
apparatus for forming an image on a recording medium, the
main body having

a motor,

an apparatus main body gear for transmitting a
10 driving force of said motor, and

a non-circular twisted hole rotated with said
apparatus main body gear, a cross-section of the twisted
hole having a plurality of corners, said
electrophotographic photosensitive drum comprising:

15 a. a cylinder having a photosensitive layer on the
peripheral surface thereof; and

b. a driving-force transmitting part mounted on one
end of said cylinder, and the driving-force transmitting
part having

20 a spur gear for transmitting a driving force
received from said main body of the apparatus to a
transfer roller provided in said main body of the
apparatus when said process cartridge is mounted to said
main body of the apparatus,

25 a helical gear provided in juxtaposed relationship
with said spur gear for transmitting the driving force
received from said main body of the apparatus to a

developing roller provided in said process cartridge when said process cartridge is mounted to said main body of the apparatus,

5 a shaft portion provided in juxtaposed relationship with said helical gear, and rotatably supported by a bearing portion when said photosensitive drum is mounted in said process cartridge, and

10 a non-circular twisted protrusion fitted into said hole provided in said main body of the apparatus, to receive the transmission of the driving force from said main body of the apparatus and of which the cross-section has a plurality of corners,

15 wherein when said photosensitive drum is mounted in said process cartridge, said shaft portion has an area overlapping an area in which said helical gear is provided, and

20 the driving force received from said main body of the apparatus through said hole and said protrusion is transmitted to said cylinder through said helical gear and said spur gear, and is transmitted to said developing roller through said helical gear, and is transmitted to said transfer roller through said spur gear.

25 21. An electrophotographic photosensitive drum according to Claim 20, wherein on the end surface of said helical gear, a circular recess is provided on a line coaxial with said axis, and said bearing portion slides

with the outer peripheral surface of said shaft portion and the inner peripheral surface of said recess which is continuous from said outer peripheral surface, and rotatably supports said shaft portion and said recess.

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22. An electrophotographic photosensitive drum according to Claim 20 or 21, further comprising an earth member for grounding said photosensitive drum to said main body of the apparatus when said process cartridge is mounted to said main body of the apparatus, said earth member being provided at the center of said driving-force transmitting part through the same in said axial direction.

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23. An electrophotographic photosensitive drum according to Claim 20, 21 or 22, wherein said driving-force transmitting part is one united body made of resin into which a fitted portion fitted to one end of said cylinder, said spur gear, said helical gear and said protrusion are formed integrally.

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24. An electrophotographic photosensitive drum according to Claim 20, 21, 22 or 23, wherein the tooth width of said spur gear is narrower than the tooth width of said helical gear, and the number of teeth of said spur gear is smaller than the number of teeth of said helical gear.

25. An electrophotographic photosensitive drum according to Claim 20, 21, 22, 23 or 24, wherein the shape of said protrusion is a twisted substantially equilateral triangular prism, the corners of said 5 substantially equilateral triangular prism are chamfered, and said protrusion is fitted into said hole of which the cross-section is a substantially equilateral triangle.

26. A process cartridge detachably mountable to a
10 main body of an electrophotographic image forming apparatus for forming an image on a recording medium, the electrophotographic image forming apparatus having
a motor,
a main body gear for transmitting a driving force
15 of said motor, and
a non-circular twisted hole provided in a central portion of said main body gear and rotated with said main body gear, a cross-section of the twisted hole having a plurality of corners, said process cartridge comprising:
20 (a) an electrophotographic photosensitive drum having:
a. a cylinder having a photosensitive layer on a peripheral surface thereof; and
25 b. a driving-force transmitting part mounted on one end of said cylinder and having
a spur gear for transmitting a driving force

received from said main body of the apparatus to a transfer roller provided in said main body of the apparatus when said process cartridge is mounted to said main body of the apparatus,

5 a helical gear provided in juxtaposed relationship with said spur gear for transmitting the driving force received from said main body of the apparatus to a developing roller provided in said process cartridge when said process cartridge is mounted to said main body of
10 the apparatus,

a shaft portion provided in juxtaposed relationship with said helical gear, and rotatably supported by a bearing portion when said photosensitive drum is mounted in said process cartridge, and

15 a non-circular twisted protrusion to be fitted into said hole when said process cartridge is mounted to said main body of the apparatus to receive the transmission of the driving force from said main body of the apparatus and of which the cross-section has a plurality of corners,

20 wherein when said photosensitive drum is mounted in said process cartridge in the axial direction thereof, said shaft has an area overlapping an area in which said helical gear is provided, and

transmits the driving force received from said main
25 body of the apparatus to said cylinder through said helical gear and said spur gear, and

transmits the driving force to said developing

roller through said helical gear, and
transmits the driving force to said transfer roller
through said spur gear; and
(b) said developing roller for developing an
electrostatic latent image formed on said photosensitive
drum.

27. A process cartridge according to Claim 26,
wherein on the end surface of said helical gear, a
circular recess is provided on a line coaxial with said
axis, and said bearing portion slides with the outer
peripheral surface of said shaft portion and the inner
peripheral surface of said recess which is continuous
from said outer peripheral surface, and rotatably
supports said shaft portion and said recess.

28. A process cartridge according to Claim 26 or 27,
further comprising an earth member for grounding said
photosensitive drum to said main body of the apparatus
when said process cartridge is mounted to said main body
of the apparatus, said earth member being provided at the
center of said driving-force transmitting part through
the same in said axial direction.

29. A process cartridge according to Claim 26, 27
or 28, wherein said driving-force transmitting part is
one united body made of resin into which a fitted portion

fitted to one end of said cylinder, said spur gear, said helical gear and said protrusion are formed integrally.

30. A process cartridge according to Claim 26, 27,
5 28 or 29, wherein the tooth width of said spur gear is
narrower than the tooth width of said helical gear, and
the number of teeth of said spur gear is smaller than the
number of teeth of said helical gear.

10 31. A process cartridge according to Claim 26, 27,
28, 29 or 30, wherein the shape of said protrusion is a
twisted substantially equilateral triangular prism, the
corners of said substantially equilateral triangular
prism are chamfered, and said protrusion is fitted in
15 said hole of which the cross-section is a substantially
equilateral triangle.

32. A driving-force transmitting part for use in
a process cartridge detachably mountable to a main body
20 of an electrophotographic image forming apparatus for
forming an image on a recording medium, the
electrophotographic image forming apparatus having
a motor,
a main body gear for transmitting a driving force
25 of said motor, and
a non-circular twisted hole formed in the central
portion of said main body gear and rotated with said main

body gear, a cross-section of the twisted hole having a plurality of corners, said driving-force transmitting part comprising:

a fitted portion to be fitted to a cylinder of an electrophotographic photosensitive drum in order to be mounted on one end of said cylinder;

a spur gear for transmitting a driving force received from said main body of the apparatus to a transfer roller provided in said main body of the apparatus when said process cartridge is mounted to said main body of the apparatus;

a helical gear provided in juxtaposed relationship with said spur gear for transmitting the driving force received from said main body of the apparatus to a developing roller provided in said process cartridge when said process cartridge is mounted to said main body of the apparatus;

a shaft portion provided in juxtaposed relationship with said helical gear, and rotatably supported by a bearing portion when said photosensitive drum is mounted in said process cartridge; and

a non-circular twisted protrusion to be fitted into said hole to receive the transmission of the driving force from said main body of the apparatus and of which the cross-section has a plurality of corners,

wherein when said photosensitive drum is mounted in said process cartridge in an axial direction thereof,

said shaft portion has an area overlapping an area in which said helical gear is provided, and transmits the driving force received from said main body of the apparatus through said hole and said protrusion to said cylinder through said helical gear and said spur gear, and transmits the driving force to said developing roller through said helical gear, and transmits the driving force to said transfer roller through said spur gear.

10 33. A driving-force transmitting part according to Claim 32, wherein on the end surface of said helical gear, a circular recess is provided on a line coaxial with said axis, and said bearing portion slides with the outer peripheral surface of said shaft portion and the 15 inner peripheral surface of said recess which is continuous from said outer peripheral surface, and rotatably supports said shaft portion and said recess.

34. A driving-force transmitting part according
20 to Claim 32 or 33, further comprising an earth member for grounding said photosensitive drum to said main body of the apparatus when said process cartridge is mounted to said main body of the apparatus, said earth member being provided at the center of said driving-force transmitting 25 part through the same in said axial direction.

35. A driving-force transmitting part according

to Claim 32, 33 or 34, wherein said driving-force transmitting part is one united body made of resin into which the fitted portion to be fitted to one end of said cylinder, said spur gear, said helical gear and said 5 protrusion are formed integrally.

36. A driving-force transmitting part according to Claim 32, 33, 34 or 35, wherein the tooth width of said spur gear is narrower than the tooth width of said 10 helical gear, and the number of teeth of said spur gear is smaller than the number of teeth of said helical gear.

37. A driving-force transmitting part according to Claim 32, 33, 34, 35 or 36, wherein the shape of said 15 protrusion is a twisted substantially equilateral triangular prism, the corners of said substantially equilateral triangular prism are chamfered, and said protrusion is fitted in said hole of which the cross-section is a substantially equilateral triangle.

20 38. An electrophotographic image forming apparatus to which a process cartridge is detachably mountable for forming an image on a recording medium, comprising:

25 (a) a motor;
(b) a main body gear for transmitting a driving force of said motor;

(c) a non-circular twisted hole provided in a central portion of said main body gear and rotated with said main body gear, a cross-section of said twisted hole having a plurality of corners;

5 (d) a transfer roller for transferring a developed image formed on said electrophotographic photosensitive drum to said recording medium; and

(e) a mounting portion for detachably mounting the process cartridge, the process cartridge having:

10 (i) an electrophotographic photosensitive drum including:

a. a cylinder having a photosensitive layer on a peripheral surface thereof;

b. a driving-force transmitting part mounted on one end of said cylinder, and the driving-force transmitting part having

20 a spur gear for transmitting a driving force received from the main body of said apparatus to said transfer roller when said process cartridge is mounted to said main body of the apparatus,

a helical gear provided in juxtaposed relationship with said spur gear for transmitting the driving force received from said main body of the apparatus to a developing roller provided in said process cartridge when 25 said process cartridge is mounted to said main body of the apparatus,

a shaft portion provided in juxtaposed relationship

with said helical gear, and rotatably supported by a bearing portion when said photosensitive drum is mounted in said process cartridge, and

5 a non-circular twisted protrusion fitted into said hole to receive the transmission of the driving force from said main body of the apparatus when said process cartridge is mounted to said main body of the apparatus, and of which the cross-section has a plurality of corners,

wherein when said photosensitive drum is mounted in
10 said process cartridge in the axial direction thereof, said shaft portion has an area overlapping an area in which said helical gear is provided, and transmits the driving force received from said main body of the apparatus through said hole and said protrusion to said
15 cylinder through said helical gear and said spur gear, and transmits the driving force to said developing roller through said helical gear, and transmits the driving force to said transfer roller through said spur gear; and

(ii) said developing roller for developing an
20 electrostatic latent image formed on said photosensitive drum.